DETERMINANTS OF NEW PRODUCT PERFORMANCE:

A CONTEXT OF SMART CONNECTED PRODUCTS

Synopsis

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SYNOPSIS

Industrial product manufacturing firms are going through a transformational change driven by the challenges put forth by “Industrial Internet Consortium” in the USA and “High-tech Strategy 2020” in Germany. As stated by Arnold, Kiel and Voigt (2016) these initiatives are aimed at deployment of “Industry 4.0”. Swift advances in Industry 4.0 have spurred incredible progress in evolving the future generation of manufacturing technology. Industry 4.0 deployment demands inter disciplines including cyber-physical Systems (CPS), Internet of things (IoT), cloud computation, business process and industrial integration including information (e.g. Da Xu, He and Li, 2014; Schmidt, Möhring, Härting, Reichstein, Neumaier and Jozinović, 2015; Kiel, Müller, Arnold and Voigt, 2017). Study related to assessment of Industry 4.0 published by Schumacher et al. (2016) focused on a model to assess readiness of organization for Industry 4.0 deployment. The model contained nine dimensions belonging to products, operations, technology, customers, governance, strategy, culture, people and leadership. The most critical dimension is product, Industry 4.0 is fostering the evolution of new set of product types the Smart connected products (SCP).

Smart connected products are changing the form, fits and definitions of the traditional product types (Porter and Heppelmann, 2015; Müller, Traub, Gantner, Veile, and Voigt, 2018). Smart connected products subtly move the product-based business to system centric solution business, thereby making the new product success a back-breaking task (Halecker and Hartmann, 2013). Hence, it is vitally important to understand determinants influencing new smart connected products performance (NSCPPe).

An exhaustive research is available on new products performance (NPP) of traditional products. Recent literatures published related to cyber physical systems (CPS), industrial internet

of things (IIOT) and Industry 4.0 deciphered the perspectives related to smart products and connected products development challenges.

1.1 Research background

Today, industrial product manufacturing firms must endure the challenges presented by the global initiatives. As stated by Kiel et al. (2017) the "High-tech Strategy 2020" and "Industrial Internet Consortium" aim at deployment of "Industry 4.0". This challenges industrial product manufacturing firms to act upon the new product and business model development to sustain their global competitiveness and make best out of the opportunities created stated Ramsauer (2013).

Industry 4.0 is going to create more than $2.3 trillion opportunities in global industrial manufacturing sector by 2025, stated Thierer and Castillo (2015). Industry has forecasted around 50 billion connected devices by 2020, which is fostered by industrial internet of things (IIOT) (Tekinerdogan, 2017). To sustain firm's business growth, enhance productivity and flexibility in manufacturing, Industry 4.0 is transforming traditional manufacturing firms into smart factories. Industry 4.0 initiatives are transforming traditional manufacturing firms into smart factories to sustain manufacturing business growth, enhance profitability, productivity and safety (Kagermann, Helbig, Hellinger, and Wahlster, 2013). Industry 4.0 is creating a wave of changes in manufacturing industry evolving Cyber physical systems built by SCP (Sniderman, Mahto and Cotteleer, 2016).

Industry 4.0 along with an extensive business opportunity poses several manufacturing and technological challenges (Bauernhansl, Ten and Vogel-Heuser, 2014; Botthof and Hartmann, 2015). There is an increasing competition industrial manufacturing firms must face, which are

posed by new competitors. Shortened product development and technology innovation development are making the competition dynamic. Besides these the industrial product manufacturers must cope with uncertainties cropping up because of volatile market conditions. A subtle challenge the product manufacturing industries observed is increased product complexity, due to shift towards intelligent and system centric solutions (Wirtz, Pistoia, Ullrich, and Göttel, 2016; Spath, Gerlach, Hämmerle, Schlund and Strölin, 2013; Bauernhansl et al., 2014; Bauer, Hämmerle, Schlund and Vocke, 2015).

The essential elements required for the deployment of IIoT and Industry 4.0 are cyber physical systems (CPS). CPS empower the assembling of cutting-edge information technologies to establish connectivity with traditional hardware mechanical and intelligent electronic components. Deployment of effective CPS requires connected products as building blocks that enable the communication among the components of CPS. (Kagermann et al., 2013; Ramsauer, 2013).

SCP consists of three tenets as shown in Figure 1, defined by Porter and Heppelmann (2014). First tenet is a traditional mechanical hardware component, generally referred as ‘Asset’. Second tenet consists of intelligent sensors, controllers, graphical user interfaces (GUI) embedded with software, referred as ‘Intelligence’. Third tenet consists of cloud-based products including software on cloud, communication protocols referred as ‘Connectivity’. SCP are formed by stacking of these three tenets in varied combinations. Hence, the framework to predict NSCPPe should have variables influencing NPP of new traditional mechanical product along with connected products.

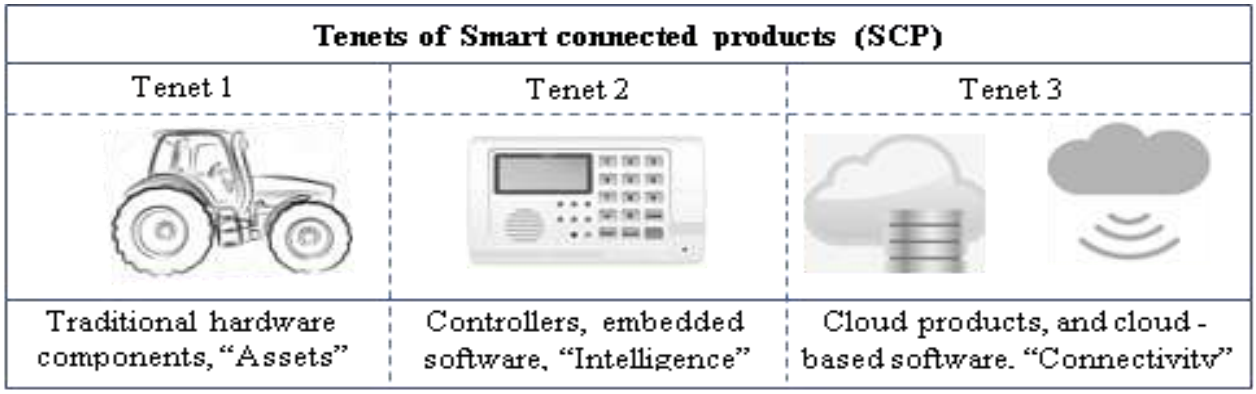
Tenets of Smart connected products (SCP)
Tenet 1
Tenet 2
Tenet 3
Traditional hardware components, "Assets"
Controllers, embedded software, "Intelligence"
Cloud products, and cloud - based software. "Connectivity"

Figure 1. Smart connected products

Several researches indicate that attaining superior new smart connected products performance (NSCPPe) is a stimulating task (Halecker and Hartmann, 2013; Porter and Heppelmann, 2015; Müller et al., 2018). An exhaustive empirical research is available related to new products performance (NPP) of traditional products. The capability to develop, launch and commercialize the smart connected products (SCP) can bestow firms with a competitive advantage, stated by Lasi et al. (2014). New smart connected products performance (NSCPPe) is vitally important for the organic growth and profitability of the product manufacturing firms. Hence, it is critically important to understand determinants influencing NSCPPe. Establishing the empirically derived frameworks for NSCPPe is critical to strengthen academic knowledge base and enable the practitioners to attain superior NSCPPe.

Literature review in this study identified the determinants influencing NPP of traditional products and smart connected products. The determinants identified by the research are "latent variables" which are measurable "constructs". The determinants identified from literature review are having predictor capability. These latent variables are arranged to form a unique framework of NSCPPe.

Determinants influencing NPP of the traditional products were major research focus of marketing academia and practitioner fraternity for several decades. Several frameworks to establish relationships among these determinants and NPP have been studied. (e.g. Cooper and Kleinschmidt, 1987; Calantone and Benedetto, 1990; Cooper, 1990; Montoya Weiss and Calantone, 1994; Song and Parry, 1994; Calantone, Schmidt and Benedetto, 1997; Kim and Wilemon, 2002; Milson and Wilemon, 2006; Droge, Calantone and Harmancioglu, 2008; Li and Huang, 2012; Cooper and Sommer, 2016). These studies are majorly related to traditional products which evolved till third industrial revolution, including industrial automation products with embedded software, fostered by cutting edge information technology (IT).

Crawford (2008) stated that NPP is measured in terms of market success. Best in class firms achieved superior NPP up to 75.5% and rest achieved 53.8% of new products launched. New product success rate achieving superior NPP improved from 40% to 59% during the years 1990 to 2000 (PDMA, 2004; Belliveau, Griffin, and Somermeyer, 2004; Barczak and Kahn, 2012). Various empirical studies to examine relationships among the determinants belonging to stages across product life cycle was conducted during last three decades, (e.g. Kohli and Jaworski, 1990; Kohli, Jaworski and Kumar 1993; Slater and Narver, 1993; Deng and Dart, 1994; Story, Hurdley, Smith and Saker, 2000; Hultink, Hart, Robben and Griffin, 2000; Langerak, Hultink and Robben, 2004; Pattikawa, Verwaal and Commandeur, 2006; Zhang and Duan, 2010; Rijsdijk and Hultink, 2013; Akroush 2012; O'Dwyer and Ledwith, 2009; Carbonell and Escudero, 2010; Cooper and Sommer, 2016; Guo, Wang, Hao and Saran, 2018).

Several empirical studies have been conducted to examine relationships among the determinants influencing NPP belonging to different stages across product life cycle during last three decades, (e.g. Kohli and Jaworski, 1990; Kohli et al., 1993; Narver and Slater, 1990;

Langerak et al., 2004; Pattikawa et al., 2006; Zhang and Duan, 2010; O'Dwyer and Ledwith, 2009; Carbonell and Escudero, 2010; Cooper and Sommer, 2016; Guo et al ., 2018). Several critical meta-analyses evolved till 2006, which have categorized these determinants in to four categories Environment, Strategy, Organizational and Processes. These meta analyses comprehended the existing research efforts on NPP of traditional products and set directions for future studies. Some of the key meta analyses studies in last three decades (Montoya-Weiss and Calantone, 1994; Szymanski and Henard 2001; Pattikawa et al., 2002; Pattikawa et al., 2006).

Numerous studies have established the factors influencing NPP of the traditional products. These factors are the latent variables empirically established as measurable constructs. These determinants are belonging to various stages of the new product development (NPD), (e.g. Kohli et al., 1993; Narver and Slater, 1990; Langerak et al., 2004; Carbonell and Escudero, 2010; Zhang and Duan, 2010; Cooper and Sommer, 2016; Guo et al., 2018).

Several critical meta-analyses evolved till 2006, categorized these latent variables in to four categories Environment, Strategy, Organizational and Processes. These meta analyses comprehended the research efforts on NPP of traditional products and set directions for future studies. They also are critical source for literature review. Some of the key meta analyses studies in last three decades are from Montoya-Weiss and Calantone (1994), Szymanski and Henard (2001) and Pattikawa et al. (2006). The research selected "Market orientation" and "New product development proficiency" are the two key latent variables identified by literature as latent variables having significant influence on NPP.

Several case studies and research articles have been published emphasizing need for unique business models, business model innovation (BMoI) to deploy Industry 4.0, IIOT, CPS, and monetize SCP. Numerous case studies and perspectives have been published related to

Industry 4.0 and SCP. (e.g. Baden - Fuller and Haefliger, 2013; Tekinerdogan, 2017; Smith, Maull and Ng, 2014; Wortmann and Flüchter, 2015; Zhou, Liu and Zhou, 2015; Saucedo-Martínez, Pérez-Lara, Marmolejo-Saucedo and Salais-Fierro, 2017; Liao, Deschamps, Loures and Ramos, 2017; Müller et al., 2018). The latent variables representing the key perspectives which are shared in the literature related to Industry 4.0, CPS, SCP and IIOT are “Proactive market orientation”, “Value proposition innovation”, “Value creation innovation” and “Value creation innovation”.

The research conceptualized unique frameworks for New smart connected products performance (NSCPPe) utilizing the latent variables Proactive market orientation (PAMO), New product development proficiency (NPDP) and Business model innovation (BMoI). Research also conceptualized unique frameworks containing marketing execution proficiency (MExP), technical execution proficiency (TExP), Value proposition innovation (VPR), Value creation innovation (VCR) and Value capture innovation (VCA),

The study recommended to investigate the structural relationship of BMoI stage activities with new product development (NPD) stage activities, which may reveal the improvements needed on the current NPD stage gate process to attain superior NSCPPe. The unique conceptual framework of latent variables for NSCPPe developed in this study contain latent variables from both NPD stage and business model innovation (BMoI) development stage. NPD stage latent variables are from literature related to new traditional hardware products. BMoI development stage latent variables are derived from perspectives shared in literature related to connected products, Industry 4.0, Cyber physical system (CPS), SCP and IIOT.

The study selected latent variables affecting the NPP of traditional mechanical products and connected products from NPD and BMoI stages. The latent variables referred in this study

are latent variables in nature, which are measurable constructs. Study organized the selected latent variables which are measurable constructs, along the value chain of development, launch and commercialization of SCP to evolve conceptual framework.

1.2 Research framework

The research framework contains four key elements including the literature review, conceptual framework, empirical study and research implications. The research identified determinants influencing the new product performance of traditional products and smart connected products. It suggested a theoretical framework and empirically established the framework of latent variables “PAMO”, “NPDP”, “NSCPPe” and endogenous variable “BMoI”. Research suggested the practitioners and the academicians that the new product development and business model development are key to attain the superior NSCPPe.

The research decomposed the new product development and business model development activities to establish the relationships between them. Study recommended to evaluate the relationship between the BMoI and NPD stage latent variables empirically to bring innovative changes to the prevailing stage gate process. The study identified exogenous variables Marketing execution proficiency (MExP) and Technical execution proficiency (TExP). MExP and TExP represents all the activities of NPD process execution proficiency (NPDP) (Harmancioglu, Droge and Calantone, 2009).

The study adopted the endogenous variables Value creation innovation (VCR), Value proposition innovation (VPR) and Value capture innovation (VCA) the three tenets of BMoI defined by Clauss (2017). This article aims to examine structural relationships between the

exogenous variables (constructs) MExP, TExP, NSCPPe and endogenous variables VCR, VPR, VCA, NPDP and BMoI.

The study established empirically that both BMoI and NPDP are critical to attain superior NSCPPe. Study empirically found that VPR, VCA significantly influence NPD stage latent variables MExP, TExP. The study propounded the need for an enhanced NPD process and proposed NSCPD a mutated NPD stage gate process augmented with BMoI activities to attain superior NSCPPe.

The research validated two empirical frameworks, first containing the latent variables PAMO, NPDP, BMoI and NSCPPe at this enables the research to identify the determinants of NSCPPe. The second framework is designed by decomposition of the NPDP and BMoI activities. The second framework contained TExP, MExP, VPR, VCR and VCA. Which helped in understanding the intertwined activities of NPD and BMoI to evolve new framework for new smart connected products development process.

The research identified research questions based on the literature review. The thesis is organized to answer the research questions. The research evaluated two conceptual frameworks and presented the first empirical models of NSCPPe. Second empirical model is related to NPDP – BMoI which led to new smart connected product development process (NSCPDP), mechanisms to operationalize the NSCPDP frameworks.

1.3 Key research questions

The research focused on five research questions related to new products performance in the context of new smart connected products. Following are the five research questions derived based on the literature review and gaps identified.

Table 1. Summary of research questions and gaps addressed

Research questions - (RQ)s	**Research gaps addressed**
RQ1. What are the key determinants related to new smart connected products performance (NSCPPe)?	A. Burmeister, Lüttgens and Piller (2016) and Muller et al. (2018) suggested to evolve empirical frameworks for studying Business model development like linear new product development process,
RQ2. Does the proactive market orientation (PAMO) influence the NSCPPe directly or its effect is mediated through new product development and business model innovation?	B. Narver, Slater and MacLachlan (2004), Blocker, Flint, Myers and Slater (2011) and Lamore et al. (2013) suggested to study the causal effects of Proactive market orientation on the other variables related to organizational and research development process categories.
RQ3. Should the proficient new product development proficiency (NPDP) and business model innovation (BMoI) be in series or parallel for attaining superior NSCPPe?	C. Burmeister et al. (2016) suggested to empirically validate the dilemma of practitioners “new product development first or the unique business model”
RQ4. How are the activities related to NPDP (TExP, MExP) and BMoI (VPR, VCR, VCA) are structurally connected?	D. As the third-generation stage gate process suggested by Cooper (1990), Cooper and Sommer (2016), doesn’t address the business model activities, which are influencing NSCPFP. The current NPD stage gate process may not be suitable for developing new SCP.
RQ5. Can TExP, MExP, VPR, VCR and VCA be utilized to classify the new smart connected products performance?	E. Research observed a gap in the existing literature related to empirical frameworks and predictors of new products performance in context of smart connected products.

The thesis is organized to answer research questions in chapters 5, 6 and 7. The thesis discussed the methodology of analysis, results, theoretical and managerial implications in each of these chapters.

1.4 Research scope and objectives

The research is focused on smart connected products and the challenges the industrial product manufacturers are facing to attain superior new smart connected products performance at market place. Objective of the study is to identify the gaps in the existing research related to new smart connected products development and monetization with a comprehensive literature review. It also listed the five research questions based on the existing research gaps and challenges faced by the industrial product manufacturers. It focused on delivering unique theoretical frameworks for new smart connected products to academicians to progress the research oriented towards the new smart connected products performance. The purpose of the research is also to identify the determinants of new smart connected products performance and evolve a unique framework which can be utilized to classify the smart connected products performance. The research is a novel effort to develop and suggest the practitioners with a new smart connected product development process augmented with the new product development activities and business model development activities.

1.5 Research methodology

The literature study followed the methodology explained by Webster and Watson (2002), same methodology is followed by Burmeister et al. (2016). Literature review utilized the concept driven method, initially picked recent literature related to NPP, NPD, Industry 4.0, SCP, CPS, IIOT and BMoI. Key research referred initially forms foundation (e.g. Guo et al., 2018; Cooper and Sommer, 2016; Zhang and Duan, 2010; Narver et al., 2004; Müller et al., 2018; Burmeister et al., 2016). Later study delved more into the citations tracking and acquired literature through common data bases EBSCO, JSTOR, Scopus and Google Scholar search engine.

The study conducted literature review in two parts, first part primarily focuses on published research related to NPP, latent variables influencing NPP and NPD of traditional products. The second part of literature review focuses on perspectives deciphered in literature related to Industry 4.0, Industrial IOT (IIOT), SCP, CPS, business models. Literature review discussed the findings and selected the latent variables influencing NSCPPe from both first and second parts. A unique framework of latent variables for NSCPPe is proposed with research propositions, managerial implications and future work. Literature review in the first part identified the latent variables influencing NPP of traditional products. Study identified two key latent variables from the category of strategy and process, which are having significant influence on NPP of traditional products. Second part identified the latent variables influencing connected products. Study identified four key latent variables significantly influencing NPP of connected products belonging to category of strategy and business model, based on the perspectives shared in the literature.

The study synthesized unique conceptual frameworks for NSCPPe and formulated the research problem and developed unique frameworks for predicting NSCPPe with latent variables organized along value chain of new SCP development, launch and commercialization. The study focused on the selection of key latent variables (constructs) and developed a conceptual framework referring the existing literature including PAMO, NPDP, VPR, VCR, VCA. Study defined the research problem and formulates hypotheses. The research utilized the administrable scales defined by the original research from Narver et al. (2004), Kleinschmidt and cooper (1995), Harmanciouglu et al. (2009) and Clauss (2017). The conceptual frameworks included exogenous variables PAMO, NPDP, MExP, TExP, NSCPPe, NEWCAPB, NEWTECH, NEWPART, NEWPROC, NEWOFF, NEWMKT, NEWCHN, NEWREL, NEWREV, NEW

COST. The endogenous variables included in the conceptual framework are VPR, VCR, VCA, BMoI. Study identified the research problem and formulated hypotheses.

Study focused on the SCP and collects data from 168 respondents of 127 firms related to 142 products, utilized the structural equation modeling to analyze the data. The study utilized the PLS – SEM to perform structural equation modeling to analyze the data. The study conducted the testing of hypotheses. Study revealed the theoretical, managerial implications and defined an enhanced NPD process to attain superior NSCPPe, along with scope for future research.

1.6 Contribution of the thesis

The research conducted a comprehensive literature review and revealed that existing literature offers a rich, fragmented portrait about the NPP of traditional hardware products and connected products. The identified latent variables influencing NPP of traditional hardware products, smart products and connected products are arranged along value chain of development, launch and monetization of new SCP, to evolve two unique conceptual frameworks for NSCPPe. The research proposed unique frameworks and presented research propositions emerging out of the frameworks and suggested managerial implications. It also established the best framework out of two for attaining superior NSCPPe, which serve as a theoretical guide for empirical research. Study divulged on how SCP manufacturing firms should adopt the learnings from literature review to attain superior NSCPPe. The literature review presented in chapter 2, covers the following research question with a list of managerial implications.

Table 2. Summary of theoretical contributions

#	Summary of theoretical contributions
1	Established a unique empirical model of Proactive market orientation (PAMO), New product development proficiency (NPDP), Business model innovation (BMOI) and New smart connected product performance (NSCPPe). **[Addressed the gaps identified by Burmeister et al. (2016) and Unique findings of the research]**
2	Study established that the PAMO is antecedent of NPDP. BMOI and NPDP both are influencing NSCPPe in parallel. **[Addressed the gaps identified by Burmeister et al. (2016)]**
3	Presented a unique finding that effect of PAMO on the NSCPPe is mediated through NPDP. **[Addressed the future study suggested by Narver et al. (2004)]**
4	Study established an empirical model of NPDP and BMOI activities framework. **[Supported findings from Clauss (2017) and addresses the gaps identified]**
5	Presented a unique finding that Marketing activities proficiency (MExP) and Technical activities proficiency (TExP) influence Value propositions innovation (VPR) and Value capture innovation (VCA). **[Unique findings of the research]**

Table 3. Summary of managerial contributions

#	Summary of managerial contributions
1	Research suggested that Proactive market orientation is cross functional in nature. The SCP manufacturing firms should form taskforces to deploy the PAMO.
2	Research proposed an activity matrix to plan and operationalize the PAMO along with NPD stage gate process.
3	Evolved a new transformed stage gate process having NPDP augmented with BMOI activities to attain superior NSCPPe.
4	Study suggested mechanism to track the efficacy of the new smart connected products development process NSCPDP.

The research contributions along with theoretical and managerial implication while answering the five research questions (RQ) are elaborated below.

Burmeister et al. (2016) and Muller et al. (2018) suggested to evolve empirical frameworks for studying Business model development like linear new product development process. The research developed this argument and learnings from the literature review by conducting an empirical analysis on the proposed conceptual frameworks. The empirical analysis conducted utilizing the SEM-PLS established the structural relationships among the latent variables PAMO, NPDP and BMoI. The results of the empirical study resulted in a unique model of NSCPPe.

Also, there are several unique findings from the research. First, the PAMO doesn't influence the NSCPPe directly, its effect is mediated through the NPDP. Second the framework best described the NSCPPe if PAMO precedes the NPDP and BMoI is conducted in parallel to NPDP. This leads to a unique empirically validated model with a series of managerial implications describing the need for operationalizing this framework and PAMO. Chapter 5 of the research answered the research questions RQ1 and RQ2 listed in the table 2.

Narver et al. (2004), Blocker et al. (2011) and Lamore et al. (2013) suggested to study the causal effects of Proactive market orientation on the other variables related to organizational and research development process categories. This answered the RQ2 listed on the table 2.

Several questions raised after developing the unique framework of latent variables. First, how to operationalize the framework, second how are the activities of NPDP and BMoI are intertwined. Third, whether the existing stage gate NPD process need to be augmented with the BMoI activities to attain superior NSCPPe.

Burmeister et al. (2016) suggested to empirically validate the dilemma of practitioners "new product development first or the unique business model". To answer this, the research investigated the framework by decomposing the NPDP into marketing execution proficiency and technical execution proficiency.

Research arranged the selected latent variables include MExP, TExP, NPDP, VCR, VPR, VCA, BMoI and NSCPPe along the value chain of development and monetization of NSCPPe. Research revealed the theoretical, managerial implications and defined an enhanced NPD process to attain superior NSCPPe, along with scope for future research.

The study empirically established a unique framework that explained the structural relationship between the NPD stage and BMoI stage activities. The study addressed the research gaps identified by Burmeister et al. (2016) and Clauss (2017), which suggested to evaluate the influence of BMoI on other functions. The findings from this study have theoretical implications as they empirically established the structural relationships between the VPR, VCA with MExP and TExP.

The study contributed to management theory with managerial implications by proposing empirical framework of latent variables belonging to BMoI, NPDP and proposed an enriched NPD process infused with BMoI activities. The study brewed the inferences from the findings of empirical framework and recommended a mutated NPD stage gate process augmented with business model development activities.

Third-generation stage gate process suggested by Cooper (1990), Cooper and Sommer (2016), doesn't address the business model activities, which are influencing NSCPPe. Hence, the current NPD stage gate process may not be sufficient for developing new SCP. Research

unveiled the answers for these research questions and suggested a new smart connected products development process – NSCPDP. Research suggested the challenges associated with operationalization of PAMO and NSCPDP. It also suggested the activity matrix, which forms a template to deploy the NSCPDP. These contributions were presented while answering the RQ4.

Research conducted discriminant analysis to identify the ability of determinants in the empirical model of NSCPPe to classify and predict the new smart connected products performance. It identified discriminant function to classify the new smart connected products as "performer" and "non – performer". The discriminant function can be utilized to evolve a mechanism to measure the efficacy of the NSCPDP deployment. With these findings and contributions, the research answered the RQ5.

1.7 Summary - organization of thesis

The research is a novel approach to understand the determinants of NSCPPe, it established a framework and processes to attain superior NSCPPe. Research suggested to operationalize the PAMO, it prescribed a novel new product development process to operationalize the validated NSCPPe framework and the NSCPD. This thesis is organized in to 8 chapters.

Chapter 1 comprises of introduction and chapter 2 presented the literature review which identified latent variables from existing empirical studies, meta analyses and case studies for conceptual NSCPPe framework. It presented conceptual frameworks and research propositions.

Chapter 3 established the problem formulations and hypothesis related to the five research questions. The chapter defined the two conceptual frameworks to evaluate the structural relationships among the determinant of NSCPPe

Chapter 4 explains the methodology of analysis and presented findings from research survey which collected data from 168 respondents and 142 SCP launched from 127 firms. It suggested the data analysis method 'structural equation modelling'. It also explained the data analysis steps utilized while performing structural equation modelling – partial least square (SEM-PLS) method and hypotheses testing.

Chapter 5 put forth the hypothesis, data analysis results related to NSCPPe framework with determinants PAMO, NPDP, BMoI and NSCPPe. It also presented the theoretical and managerial implications of the proposed NSCPPe framework related to research questions RQ1, RQ2 and RQ3.

Chapter 6 presented hypothesis, data analysis, results and empirical model of NPDP, MExP, TExP, BMoI, VPR, VCR and VCA. It explained how the NPDP and BMoI activities are intertwined related and answered RQ4. Chapter 6 discussed the gaps in the existing NPD process and suggested a novel NSCPD process. It also suggested the managerial implications emphasizing on the challenges and mechanisms to deploy the NSCPDP framework.

Chapter 7 established the ability of the latent variables in empirically validated model to classify performing and under-performing new SCPs, thereby it answered the RQ5. Chapter 8, explained the managerial implications correlating to five research questions and a mechanism to operationalise the research findings, limitation of this research and scope for future work. A summary of the chapters, key focus and the deliverables are listed in the Figure 2.

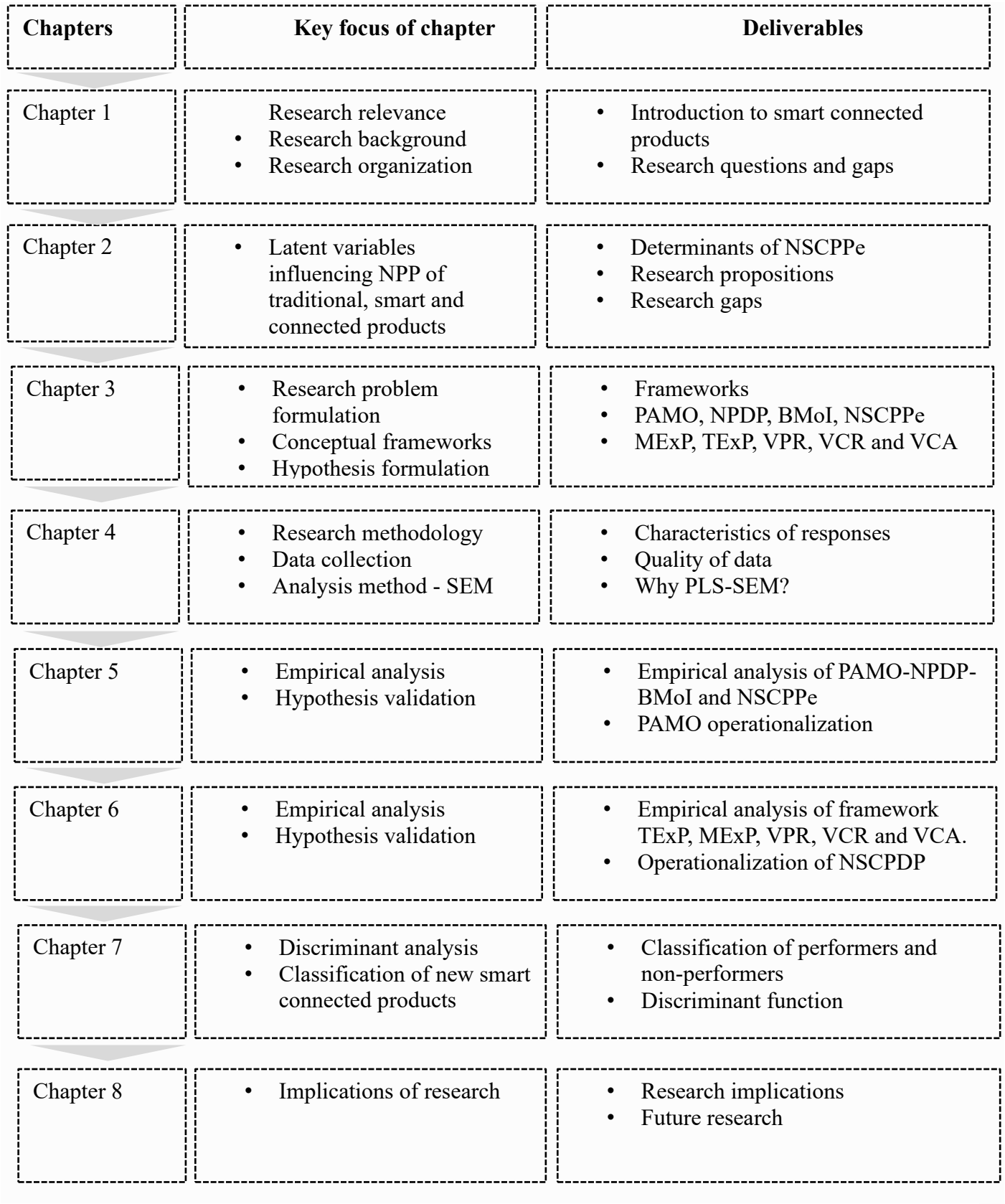

Figure 2. Organization of thesis

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